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ABSTRACT

An update is provided on North Iowa Area Community College's (NIACC's) progress toward achieving its goals with respect to the use of contemporary technologies, along with plans for further progress. Part I examines the characteristics of contemporary technology and provides information on NIACC's Contemporary Technology Strategic Planning Initiative (a three- to five-year plan for expanding the use of technological advances on campus). The next three sections focus on technology-related changes implemented in the manufacturing technology, business technology, and humanities programs. Each section provides information on equipment purchases; effects of the introduction of the new equipment on students, faculty, and the program; and plans concerning equipment selection, curricular applications, students to be served, location and layout. Finally, part V offers summary comments about the need for a continuous investment in updating knowledge, skills, and equipment, and NIACC's efforts to meet the challenge. (EJV)

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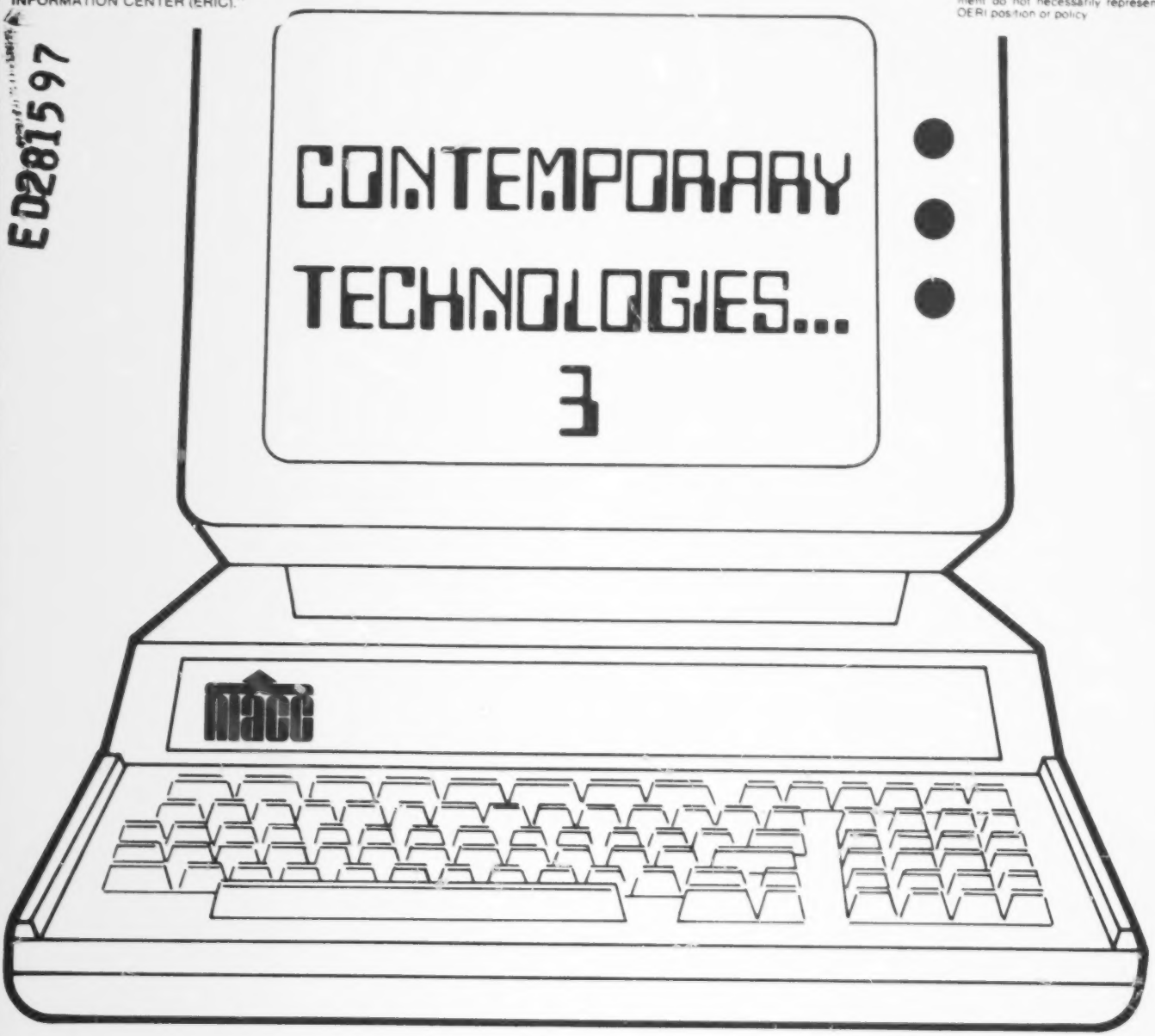

... An Updated Plan for NIACC'S Future

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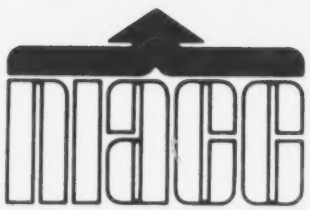
CONTEMPORARY TECHNOLOGIES . . . 3

A Progress Report and Plan for Contemporary Technology at NIACC



Presented To

Dr. David Buettner, Superintendent
and
The NIACC Board of Directors

By

The Contemporary Technology Task Force

May 19, 1987

FOREWORD

This document reports our progress towards achieving our contemporary technology initiative and presents our plans for further progress.

A comparison of this progress report and plan with our previous Contemporary Technology plans illustrates our growing ability to produce on campus documents which approach commercial quality printing. Recently developed computer skills have resulted in this document which includes several sizes of type fonts and a two-column text format with computer integrated numeric tables. Computer integrated graphics should become feasible in the not too distant future.

ACKNOWLEDGEMENTS

After reviewing our progress towards achieving this initiative, I want to thank all of the faculty involved for the many weeks of planning, training, and implementation they have invested. They have truly become heroes in coping with the challenges of change.

On behalf of the Contemporary Technology Task Force, I want to thank Dennis Brunsvold for the excellent floor plans, showing equipment locations, that he prepared for this report.

In addition, on behalf of the Contemporary Technology Task force, I express appreciation to Mariestelle Brown for her leadership in advancing our internal publishing ability and publicly thank her for the many long hours she spent mastering the publishing skills, interviewing members of the Task Force, writing draft copy, editing copy after Task-Force review, keeping the Task Force on target, and preparing the final copy.

Thank you, Task Force, for helping NIACC close our contemporary technology "gap" and for helping create a vision for further planned progress which is presented so professionally in this document.

Dr. Alfred R. Hecht, Chairman
Contemporary Technology Task Force

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PART I

UPDATING THE CONTEMPORARY TECHNOLOGY PLAN

CHARACTERISTICS OF CONTEMPORARY TECHNOLOGY

Previous plans described the growing use and integration of contemporary technology in business, industry, and postsecondary education. This plan describes several significant characteristics of contemporary technology and their implications for NIACC's initiative.

CONTEMPORARY TECHNOLOGY IS DYNAMIC

In the three years that this initiative has been pursued, those involved have found that technology is constantly changing. In the last six months, for example, both IBM and DEC, the leading computer manufacturers have announced new computer models ranging from microcomputers to mainframes. In the same period, leading microcomputer manufacturers, such as Apple and Tandy, also introduced faster models with larger processing and memory capabilities.

In the same time period, the number of manufacturers marketing less expensive clones (imitations) of the major manufacturer's lines has increased rapidly. A recent article identified 200 manufacturers of IBM clones (Stafford 122).

As a result of these continuing changes occurring in all electronics-related products, equipment selection decisions become increasingly difficult. The growing number of choices demands a larger time investment. In addition, the equipment selection criteria must be expanded to include desirable new features and judgments of whether or not the manufacturers chosen will survive the fierce competition during the useful life of the product. For example, Atari and Commodore, early leader in microcomputers. are struggling financially (Dyrli 34, 35).

In investments in computer equipment, the selection criteria must also include identifying the availability of software. Software development typically lags behind new equipment releases. This lag leaves users with limited software until companies develop new software that takes advantage of the expanded features of the new equipment.

The consideration of software availability is compounded by those manufacturers who abandon software support for their earlier models when they introduce new computers. In an article about the next generation of personal computers, John Crecine of Carnegie-Mellon University writes, "What is needed is a long-term strategy for allowing software developers and computer users to migrate to successive generations of ever more powerful computers" (5). Limited software availability may delay instructional implementation or force the choice of alternative equipment.

As a consequence of the dynamic character of contemporary technology, NIACC's equipment choices are becoming increasingly tentative. Therefore, we must regard many of the equipment items included in this plan as

generic indicators of our planned directions rather than specific choices for immediate purchase.

CONTEMPORARY TECHNOLOGY IS COMPLEX

Initial efforts to close NIACC's contemporary technology "gap" involved following industry's example of equipping separate discipilines with mostly stand-alone state-of-the-art equipment. The complexity of this new equipment required vendor training of faculty on equipment and software operation.

Since the initial investments and training, faculty in each area have been absorbing the new technology and integrating it into their curricula. Because relatively few examples of appropriate instructional applications exist to serve as models, this integration occurs gradually over time. the more complex the technology, the longer the time required for training and integration (Goetsch 22,23).

Contemporary Technologies 2 described "integration" as a complex and challenging goal underlying contemporary technology (1-3). Developing Local Area Networks (LANs) allows integration within disciplines as a step towards campus-wide integration. In her current article on Local Area Networks, Heather-Jo Traferner describes the complexity of planning, installing, and operating a LAN. She state, "Because LANs connect computers, cables, network cards, software and, most important, other users, a minor incompatability could cause a big muddle" (184). Consequently, LAN equipment and software selection is even more complex and challenging than selecting stand-alone equipment.

In addition, the implications of LANs as potential components of a campus-wide computing system expand the necessary planning activity across organizational units. At this point, the contemporary technology initiative becomes part of the emerging campus-wide computing planning effort.

The closer NIACC comes to the "cutting edge" of contemporary technology, the more complex that technology becomes. The more complex the technology, the more extensive the requirements for staff training and the greater the number of changes in organizational relationships.

CONTEMPORARY TECHNOLOGY IS COSTLY

NIACC has a college-wide equipment inventory valued at more than two-and-one-half million dollars. Assuming an average functional life of ten years for our present equipment, NIACC must invest more than $250,000 in equipment replacement each year to maintain our programs.

Because computers and other electronic equipment becomes outdated before they wear out, keeping pace with technology is costly but an essential and sound institutional investment. Many of the educational benefits of this investment are described in this report.

NIACC'S CONTEMPORARY TECHNOLOGY STRATEGIC PLANNING INITIATIVE

As a result of the multi-year nature of the initiatives in the Three- to Five-Year Plan, the goal of NIACC's Contemporary Technology initiative remains to:

> Eliminate all significant deficiencies between College educational resources and practices and commonly found equipment, procedures, or concepts in comparable educational or industrial settings.

To achieve this initiative, NIACC must "provide for regular investment in the technological currency of the College" (Three-Five-Year Plan 5). Over 1986-87, as in the previous two years, staff members in several disciplines have investigated contemporary technology trends, equipment, and educational applications in their fields. The next section provides an overview of the progress report and plans for furthering this initiative.

AN OVERVIEW OF NIACC'S PROGRESS AND PLAN

In 1986-87, expansion of contemporary technology started in 1984-86 has been explored by faculty members in the areas of Manufacturing Technology, Business, and Humanities. The next three parts of this proposal present the results of the investigations of each of these groups in the order named above.

Each of these parts includes a report on the status of the implementation of prior plans and plans for expanding technology in that area. The implementation section of each part identifies the equipment purchased since this initiative began and describes the benefits of these investments to students, programs, and faculty.

In each part, the section which describes the plan for expanding the technology in that area identifies the additional equipment desired, the ways in which the additional equipment will be used in the curriculum, the students who will be served by this equipment, the intended location and arrangement of the equipment, and the future plans for technology.

The report and plan concludes with a summary.

PART II

EXPANDING MANUFACTURING TECHNOLOGY

IMPLEMENTATION OF PRIOR PLANS

When the Board approved the purchase of a computer-aided design (CAD) system during FY 85 and then, in FY 86, agreed to the purchase of the automated manufacturing equipment, it initiated a revitalization of the programs and courses in the Manufacturing Technology Cluster.

EQUIPMENT PURCHASED

In FY 85, NIACC purchased four PSI dual-screen workstations. These workstations are networked to two hard disk CPUs which in turn are coupled to a Hewlett-Packard 7580B eight-color pen plotter. This equipment, purchased for use in the Mechanical Design program, cost approximately $118,000.

As a feature of this equipment purchase, the Mechanical Design faculty received three days of on-campus training by the vendor. In addition, one faculty member received a week of training at an off-campus workshop conducted by the vendor.

The four workstations allowed the instructors to introduce students to three-dimensional CAD and even to develop a strongly CAD-oriented curriculum for sophomores as long as the Mechanical Design sophomore class had no more than eight to ten students.

In FY 86, NIACC moved even further into the world of computerized manufacturing systems technology with the purchase of equipment totaling nearly $183,000. This purchase included the hydraulic and pneumatic training equipment needed to provide students with basic training in fluid power. It also included three major robots, a flexible manufacturing line conveyor loop with off ramps, a work cell, controllers, and logic analyzer.

With the equipment, the faculty received from 7 to 15 days of vendor training on all of this equipment.

In selecting equipment for the first increment of establishing a flexible manufacturing line, the faculty considered non-servo and servo robots; gross and sensitive robots; and pneumatic, hydraulic, and electric robots.

A non-servo robot, referred to as a "pick-and-place" robot, moves only to the end of its limits; that is, the arm is either up or down or extended or not extended. The non-servo robot cannot be programmed for any moves between its two vertical positions nor for any moves between its two horizontal positions. However, it is well suited to picking up and moving items in the manufacturing process.

Servo robotic arms, unlike non-servos, can be programmed to move to any point in the space of their envelopes, an envelope being that combination of planes and distance the arm can reach. This type of robotic arm works effectively in moving to several points in several planes, as in spot welding.

A robot with gross or imprecise movement has a capability for moving only to a designated point and has no regard for or sensitivity to any obstruction that stands in the way. While the movement and positioning of this type of robot is exact, it is not precise in the sense of being able to handle and position small components delicately and meticulously. A sensitive or precise robot has the capability for assembling electronic components on a circuit board or for inspecting a product for correct dimensions, for correct placement of holes or parts, and for correct color, all elements of quality control.

The faculty determined that initial acquisition would depend on servo and non-servo, gross pneumatic and hydraulic robots because the parts or components of a product must be manufactured before the product can be assembled or inspected by the electric-servo robot. Therefore, even though students need experience with and would benefit from an electric robot, the faculty concurred that the initial purchase should provide for the initial manufacturing process.

The limitations on the purchase also meant that the various stations on the line would have to be reprogrammed for each change in the manufacturing process as the control pendants, controllers, and Apple computer, although programmable, do not have adequate memory for storage of the programs for the robot, lathe, milling machine, and flexible manufacturing line.

With these criteria and constraints identified, the faculty selected equipment that has placed NIACC in an advantageous position in relationship to other community colleges and in its own technological development.

BENEFITS FROM MANUFACTURING TECHNOLOGY INVESTMENT

While the three-dimensional CAD and the automated manufacturing line establish NIACC as one of the leaders in providing contemporary technology for students, the most significant benefit of the equipment is its effect on the students, the program, and the faculty.

Students

In addition to students enrolled in the Mechanical Design program, students in other Manufacturing Technology programs and those in Pre-Engineering courses benefit from using the CAD system.

While students from the various programs develop skill in using CAD to a level appropriate for their needs, the Mechanical Design students meet skill objectives that make them more employable than students trained before the addition of the 3-D CAD.

Mechanical Design students create, insert, remove, and modify drawings in 3-D on the PSI system. They now have experience with two graphics systems. In addition, they are learning to understand and to work with data banks.

Non-credit students, employed and sponsored by many of the major manufacturers in the area, have an opportunity to develop sufficient familiarity with computer-aided design to enable them to frame criteria suitable for choosing hardware and software for their companies and to question vendors about the capabilities of their products. At the same time, they develop basic skills in using CAD and actually complete a design project for each of their companies. For example, employees from United Hydraulics designed a cross-section of a hydraulic

cylinder; and employees of Wallace, Holland, Kastler, Schmitz & Co. drew plat layouts.

The FY 86 investment in the automated manufacturing line has provided students with one advantage that would be available to them in no other way. That is, students have the advantage of experiencing a broad base of training in actual applications of hydraulic, pneumatic, and electronic controls.

Students now have opportunities to design, develop, control, and trouble-shoot a manufacturing system; they have an opportunity not only to study automated systems but to experience working with such a system.

As a result, many former industrial electricity candidates have heightened their objectives. They now have an incentive to accomplish more and to expand their employment career goals and their potential for employment.

Programs

General Foods listed NIACC's upgrading of the Manufacturing Technology programs and equipment as one of the company's reasons for selecting Mason City as its new plant location.

In addition to enhancing the area's potential for attracting new employers, the CAD equipment investment has enabled NIACC to provide continuing-education training for employees of the following already established North Iowa employers: David Manufacturing; Eaton Manufacturing; Winnebago Industries; Iowa Mold Tooling; Rockwell International; Wallace, Holland, Kastler, Schmitz & Co.; Curries Manufacturing; United Hydraulics; and Fleetguard.

Once students enroll in the Mechanical Design program, they witness the impact that the CAD system has on area industries. Not only do engineers and leaders in business and industry take advantage of opportunities to inspect the system when they are on campus for meetings and conferences, but they look to the NIACC system and they consult with NIACC faculty before investing in CAD systems for their own companies.

As students benefit from the upgrading of the programs and as they share their experiences with potential students, the programs benefit.

Even though the Mechanical Design faculty has implemented many of the planned curricular applications, instructors continue to study the many dimensions of the CAD system and to create additional plans for curriculum changes.

While the plan included developing instructional units in boundary definition as a step toward preparing the design for computer-aided manufacturing (CAM) on a numeric-control machine, small progress has been made in this area. The difference between the projected plan and the actual curriculum results from the problems in scheduling time for the system managers' work on the system. However, the system manager will, as a part of his teaching load, have time to do the necessary work on the system next fall.

Because the system is so sophisticated, the instructors continue to explore and to learn additional dimensions of CAD in preparation for expanding to CAM.

At the same time that the instructors are learning, they are teaching and responding to an actual enrollment in day classes that exceeds the projected enrollment by over 20 percent as shown in Table 1 on the next page.

Furthermore, just since the addition of the CAD system, enrollment in the freshman Mechanical Design class has doubled. A major portion of this increase results from potential students' awareness of the increased employment opportunities they will have with an education that includes CAD.

Table 1

Students Served
by
Three-Dimensional CAD
in FY 87 and To Be Served in FY 88

	FY 87 Enrollment		FY 88 Enrollment
Classes	Projected	Actual	Projected
DAY CREDIT			
Mechanical Design	20	30	40
Pre-Engineering	40	40	44
Electronics	40	40	48
Automated Systems	20	42	45
	120	152	177
EVENING NON-CREDIT			
Industry-Short	50	24	150
	50	24	150
TOTALS	170	176	327

Because the staff discovered that most manufacturers preferred to send their employees to non-credit Community Service offerings, the evening credit classes did not materialize.

However, the significance of the addition of the new CAD technology is reflected in the increased total of day students resulting from the increased enrollment in courses in the Manufacturing Technology Cluster.

Because many North Iowa businesses and industries are substantial users of contemporary technology, NIACC's investment in this area moves the College closer to its goal of eliminating "all significant deficiencies between the College educational resource and practices and commonly found equipment, procedures, or concepts in comparable educational or industrial settings."

While Winnebago Industries and John Deere use computer-aided design, Iowa Mold and Tooling, Schneider Metal Manufacturing, United Hydraulics, and many other firms use computer-controlled mills, lathes, and punch presses.

Advisory Council members and authorities on the needs of the labor market report that managers of industry seek employees with experience in robotics, micro-processors, and logic controllers and in the interfacing of these technologies. Therefore, the graduates of these programs are likely to find increased local and state employment opportunities.

Actual numbers of students served in day classes in other Manufacturing Technology programs aligned closely with the projected numbers. (See Table 2.)

However, the anticipated evening classes will not begin until FY 88 as the faculty has spent all available time and energy on working with the system and on developing curriculum that incorporates ever-increasing student use of all of the capabilities of the automated system.

As more graduates find positions within the state, the programs will further benefit from the growing numbers of traditional and non-traditional students who recognize the promise that successful completion of these classes offers.

Table 2

Students Served
by
Automated Manufacturing Equipment
in FY 87 and To Be Served in FY 88

	FY 87 Enrollment		FY 88 Enrollment
Classes	Projected	Actual	Projected
MANUFACTURING TECHNOLOGY			
Industrial Electricity	18	18	20
Industrial Electronics	14	18	20
Automated Systems Technology	18	18	20
Electronics Engineering Technology	24	18	20
Mechanical Design	17	20	24
Pre-Engineer	35	40	44
	126	132	148
SERVICE TECHNOLOGY			
Climate Control	18	30	30
Automotive	22	--	22
Ag Power	14	10	12
Welding	8	--	10
	54	40	64
TOTALS	188	172	222

Even though the automated flexible manufacturing line is less than a year old, it has already had an impact on the manufacturing technology curriculum.

In Contemporary Technologies...2, the faculty, in proposing the acquisition of the automated manufacturing line, cited the importance of the hands-on experience that the line would allow. That expectation has become reality. This year students have not just studied hydraulic and pneumatic systems, they have actually operated them through logic controllers just as they would in industrial settings.

Furthermore, the faculty members have realized their plan to familiarize students" . . . with a flexible manufacturing line that couples units into a manufacturing process . . ." and to allow them to ". . . work with robots as individual work cells or training stations or as parts of a process . . ." (Contemporary Technologies 2 12). As planned, students see the components as building blocks, and through interfacing, as a process unit.

As expected, the automated manufacturing line attracts students. In the programs using the system, enrollment has grown from 50 to more than 100 students. Besides serving as an effective recruitment tool, the system acts as a popular attraction on all public relations tours of the campus.

Faculty

Quite naturally, students' and area businesspersons' acclaim for the program and the CAD system adds to the pride and confidence of the Mechanical Design and engineering faculty.

The system serves, also, as a motivating factor for the faculty's continued learning and mastery of the many facets of CAD. At the same time, the faculty has developed an awareness of all graphic systems and of new and developing systems. This awareness keeps them on the "cutting edge" of advancements in all forms of manufacturing technology.

Of course, to enable students to use the automated manufacturing system, the faculty has pursued training in automation and in hydraulic and pneumatic systems. This growth has opened new horizons for faculty members' collaborative work in graphics

design and manufacturing processes and for providing advice to local manufacturers.

They also grow in confidence as frequent visitors, groups and individuals, express their interest and regard for the equipment and the faculty's capabilities with the system.

PLANS FOR EXPANDING MANUFACTURING TECHNOLOGY

According to Forecasting International, Inc., in the 1990's, 600,000 new job opportunities will emerge nationally for Computer-Assisted Design Technicians and for Computer-Assisted Manufacturing Specialists. In Iowa alone, the Iowa Job Service Department predicts that, during 1987-88, the growth and replacement needs in the field will require 50 competent workers at wages ranging from $7.95 to $13.95 an hour.

John Krouse, in a recent issue of High Technology, described the outlook for flexible manufacturing systems.

"A total of 50 full-scale flexible manufacturing systems (FMS) were running in the U.S. in 1985. FMS vendors earned $143 million last year, based on the 12 new units sold and revenues derived from customer services, according to the Yankee Group (Boston), a market research firm. By 1990, 284 systems should be in place and revenues should reach $832 million. . . .

"Flexible systems enable manufacturers to utilize their machinery more efficiently . . . while lowering lead times by an average of 40% in response to market demands and engineering changes, according to A Competitive Assessment of the U.S. FMS Industry, a report from the U.S. Department of Commerce. It is easier and quicker to reprogram an FMS unit to turn out different parts than to buy a new set of stand-alone machines or to reconfigure high-volume production lines for each new part."

Krouse goes on to quote Alice Green, a consultant in the Engineering Automation Group at Arthur D. Little.

"FMS has appeared at just the right time for U.S. manufacturing companies beset by an aging population of machine tools, high labor rates, and too much capital tied up in work-in-process inventory" (26).

While the employment opportunities for technicians has already escalated, the future portends a need for even more persons trained to work in companies that will continue to expand their use of FMS. With that potential for placement of highly skilled graduates, the Manufacturing Technology Cluster has moved forward in its plans for expanding technology.

EQUIPMENT SELECTION

In their planning, the Cluster members have identified equipment necessary to continue the important shift from pen-and-paper design to computer-aided design and the equipment necessary to continue to move forward in the development of a computer-integrated manufacturing system.

The growth of the Mechanical Design program and the expanding number of Manufacturing Technology students using CAD, as well as the increasing emphasis on CAD, have created a problem demanding an answer: too many students for too few workstations. For example, as long as the sophomore class, whose drawing is done exclusively on CAD, had an enrollment under 10, the four work stations were sufficient as two students could share a

computer. However, enrollment has more than doubled. Therefore, if students are to have adequate access, additional workstations are necessary.

In addition, currently, once students begin a project on a computer connected to one CPU, they must continue, in future design on that project, to work on one of the two computers connected to that CPU. When those computers are in use, this obligation to use a particular computer configuration slows the students' progress. With the TTY network, a student may access his or her drawing from any of the CAD workstations. This accessibility enables the student to work on a project whenever any computer is free.

Furthermore, the networked computer control system with appropriate data-acquisition-sensing equipment is necessary for controlling the flexible manufacturing line and several related manufacturing functions. It will, also, track, record, analyze, and report the status and manufacturing results through communication links.

With the addition of the electric robot, one of the most commonly used in the electronics industry, NIACC will have a full complement of robot types. This robot, which will fulfill an assembly or inspection position on line, has a SCARA-type work envelope and demonstrates highly controllable precision and repeatability in motion. It, also, provides an excellent example of dependable feedback circuits.

The importance of the addition of the the electric-servo robot in the progressional development of the flexible manufacturing line becomes apparent in the following description of a typical production process.

A student has designed an aluminum nameplate to be mounted on a wood base. Now, to apply the concepts he or she is learning in class, the student must program the flexible manufacturing line to produce this product. First, the student preps the on-loading ramp with a pallet loaded with an aluminum plate and another pallet loaded with a wood mounting.

The student's program now takes over the production of the product. The plate and mounting are loaded onto the line via pneumatic controls. As they move down the line, a laser, reading a bar code on the plate, identifies the process the plate is to follow.

The aluminum plate proceeds down the flexible line and sets off a switch which tells the computer the position of the plate. The Hercules hydraulic non-servo robot then moves the plate off the line and places it on the milling machine where a pneumatic vise clamps the plate in place. Then, the milling machine etches the name on the plate.

While the milling machine is processing the plate, the wooden mounting enters the flexible line and moves into position to receive the plate. When the milling process is complete, the robot on-loads the plate and positions it on the wooden mounting.

At this point, the process breaks down. The nameplate, like so many products, requires assembly. Currently, NIACC has no robot that can assemble the parts of a product nor that can inspect the product for quality control.

The electric-servo robot will serve in this capacity of assembly. With the electric-servo robot in place, the wood mounting with the plate in place will move to the electric-servo robot and will signal its presence through a switch. The robot will off-load the

product and will position screws in the sides of the plate to secure the plate to the wood mounting and, then, will on-load the nameplate to the line where it will continue to move to the off-load ramp from which it will be transferred to the inventory warehouse.

With the Jupiter electric-servo, the student will be able to produce a manufacturing line that includes assembly or, if he or she chooses, inspection of a product that does not require assembly.

The Jupiter electric-servo robot can also be used as a workcell to demonstrate the precision with which it can position and assemble components on a circuit board. This precision depends on the robot's capacity for feedback; feedback is the robot's capability for sensing its location in respect to the product's location.

At the present time, once the student has programmed the flexible manufacturing line, another person may, without intentionally doing so, delete the first student's program. This deletion problem exists because the current programming system has no memory capacity for program storage. To resolve this problem, the faculty has chosen the IBM-PC AT, which will not only provide for the storage of programs but also will allow for the expansion capabilities of the manufacturing line and for the graphic depiction of the program results.

After thorough analysis of employers' and, therefore, students' needs, of curricular applications, and of current technology, the Manufacturing Technology cluster selected the equipment that would best meet the established needs. Because compatability stands as a primary criteria, they selected this particular equipment, identified in Table 3, to ensure compatability with the present equipment and programs.

Table 3

Proposed Industrial Technology Purchases

	Equipment	Cost Unit	Cost Total
2	12 1/2 MHz boards with trade-in	$ 4,000	$ 8,000
2	Additional stations	8,425	16,850
1	6.1 TTY network	500	500
3	Station additions with CPU and tape back-up system	18,315	54,945
1	CAM addition (Programming)	3,000	3,000
1	Amatrol Jupiter D.C.electric-servo robot	37,920	37,920
1	Robot accessories	2,468	2,468
1	Workcell	3,449	3,449
1	IBM PC Model AT	4,000	4,000
	TOTAL		$131,132

CURRICULAR APPLICATIONS

Curricular applications will be guided by instructors' evaluations of need and by reports from employers, such as that expressed in the following excerpt from Digital News.

"The emphasis is on integration of functions within the plant and on developing the correct data and priorities to execute the functions.

"An example of CIM operation at Springfield is what Drab [Information Systems and Technologies Manager] calls the "flexible manufacturing" line for cartridge tapes. The system keeps track of data collection, a materials ordering system and a manufacturing processing sheet.

"When a line operator logs on to a system, Drab says, the system first states whether there have been any late changes in the product. If needed, a dial-up process sheet gives the

operator instructions. Each operator also can pull up a graphic display of each product being assembled to provide an overall view of what each person is making.

"Log data, such as the quality of materials or how many units of a certain subassembly are needed, goes directly into the data collection facility. If a part is bad, a new part can be dialed up. . . .

"The type of employee needed for such a facility has changed, Drab says. In the past, the employees didn't need any specialized training. Today, the company looks for "a more technically competent employee, someone with a sense of understanding of how the job is done theoretically" (Lawton 10).

Because of the significance of a piece of equipment's curricular applications in the selection of that equipment, many of the curricular applications have already been covered in the preceding section.

The Mechanical Design faculty will use the new equipment to allow the emphasis in that program to continue the shift from table drawing to even more electronic drawing. Furthermore, the added workstations will allow needed changes in drafting related courses in the automated systems programs. These changes depend on having enough CAD workstations to ensure a student-computer ratio of two to one.

In the Automated Systems programs, the faculty will use the equipment both as a part of the manufacturing line and as a stand-alone workcell. In the Workcell Integration course, the robot will operate as part of the flexible manufacturing line system. In the Microprocessors course, the robot will function as a demonstration tool; and in Robotics, as a stand-alone workcell to enable students to operate, program, and service electric microprocessors and motors and to work with feedback loops that tell the computer the exact location of the end effector (hand) of the robot in its envelope. This feedback information provides the computer with the information needed to send the appropriate signals to the line for the continuation of the process.

Graduates of the Automated Systems programs will be prepared to work with electric-servo robots in companies, such as Unisys (Sperry), where they will be expected to have skills in installing, interfacing, maintaining, modifying, and troubleshooting this type of robot and its controller.

With this upgraded equipment, students will be able to create software for products of the students' unique designs. Then, they will be able to select and place robots in an efficient flexible manufacturing line configuration planned to meet the demands of the product and the process.

Because of the IBM-PC's keyboard, memory, and storage capability, students will develop proficiency in generating, modifying, and storing programs for the devices that control the lathe and milling machine and for the manufacturing line itself. Moreover, they will be able to see the manufacturing process in graphic action on the computer before they use the process on the line. In this way they will anticipate and troubleshoot problems before those problems can occur in production.

This current expansion will be another step toward a full integration of NIACC's CAD/CAM system with the flexible manufacturing lines computer network.

STUDENTS TO BE SERVED

As shown in Tables 1 and 2, growing numbers of students will use this equipment. All students in the Manufacturing Technology Cluster courses, in Climate Control, and in Pre-Engineering programs will have experience with the system. As more evening courses develop, those students, too, will work with the entire system.

LOCATION AND LAYOUT

Figure 1 shows the present location and placement of NIACC's current CAD equipment; Figure 2 shows the redesigned location and placement of the CAD equipment. Figure 3 shows the integration of the Jupiter robot and the IBM-PC into the flexible manufacturing line.

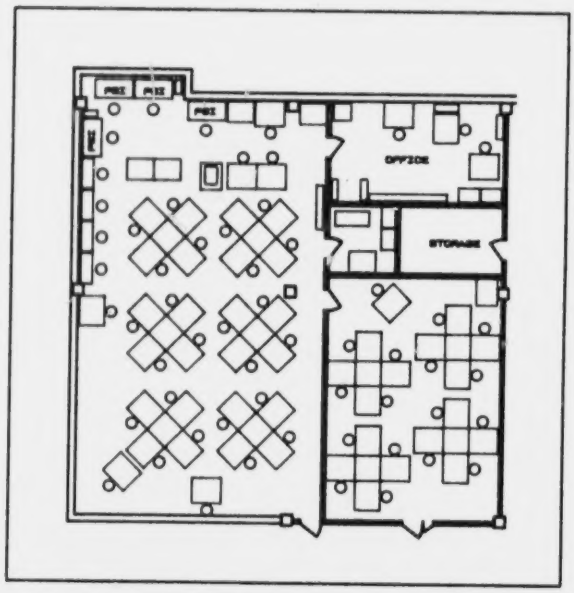

Figure 1

Present Layout
of
Mechanical Design Area

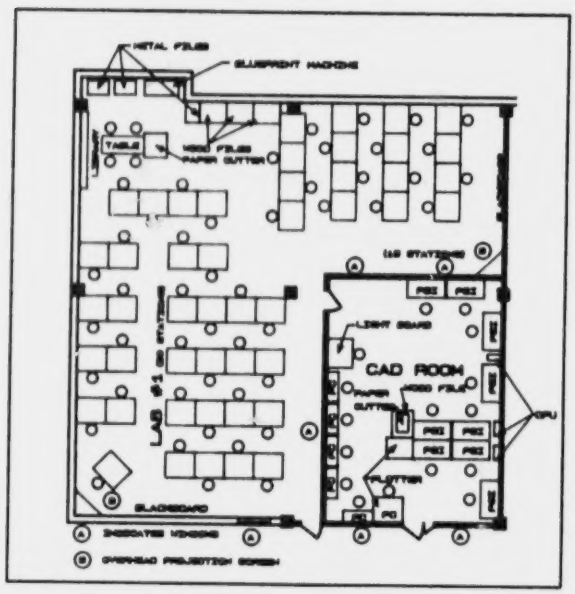

Figure 2

Layout of Redesigned
Mechanical Design Area
with
Proposed CAD Workstations

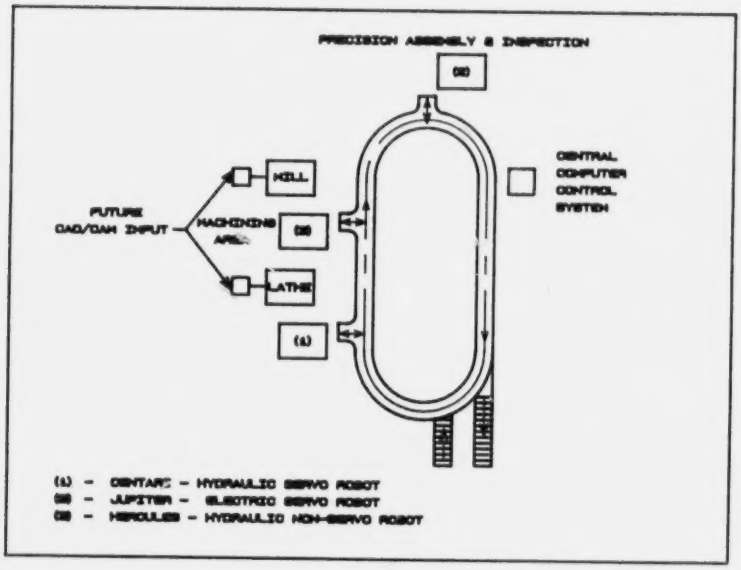

Figure 3

Layout of Flexible Manufacturing Line
with
Proposed Electric-Servo Robot and IBM-PC AT

FUTURE PLANS FOR MANUFACTURING TECHNOLOGY

The proposed CAD equipment investment includes CAM software. This software will provide faculty with the opportunity to develop skills in this aspect of the technology. They will, then, be in a position to incorporate this technology into the curriculum.

As the faculty members of the Manufacturing Technology Cluster look to the future, they see the development of a networked computer-aided manufacturing system and even a computer-integrated manufacturing (CIM) system which will not only unite the hardware and software in the Automated Systems and the Mechanical Design labs but will also connect them with other computers in the College.

As CAD/CAM and the flexible manufacturing line are networked, students will be able to create software for student designed products. Then, they will be able to select and place robots in an efficient flexible manufacturing line configuration planned to meet the demands of the product and the process.

In the future, The Manufacturing Technology Cluster plans to add to the system to include CIM. With CIM as a part of a campus-wide network, students will send outputs to the Business Division for inventory control and cost analysis and possibly to the Communications course for documentation support.

These contemporary applications depend on the interaction of computers. Therefore, to maintain a reputation for preparing graduates who are leading contenders for high-tech positions in highly respected companies, the College needs to initiate a plan for networking campus computers.

PART III

EXPANDING BUSINESS TECHNOLOGY

IMPLEMENTATION OF PRIOR PLANS

As a result of the Board's approval of the two previous Contemporary Technology proposals, the Business Division has moved to a position second to none in providing the learning environment necessary for preparing students to compete in today's highly technical society.

EQUIPMENT PURCHASED

Over the past two years, the Business Division has purchased 28 DECmate III computers, 19 IBM PCs, 5 printers, and software. This hardware and software required an investment of $196,000. In addition, the Division acquired eight more IBM PCs when Community Services replaced them with 10 Compaq portable computers.

BENEFITS FROM BUSINESS TECHNOLOGY INVESTMENT

The addition of this technology and the design of the business environment have proven to be powerful marketing tools.

Students

Students enjoy the experience of working in an office environment of the 1990's. They feel they benefit from this background by having a lower level of anxiety at meeting new technology in their future workplaces. A student in the transfer business program said, "Hands-on experience has lowered my anxiety level of using computers. Also getting assignments completed is faster because of skills attained working with the computers" (Bohach).

They, also, gain by their familiarity with a variety of computers and software. Consequently, NIACC students graduate with a high degree of self-confidence. A student in the Legal Secretarial Program expressed her feeling in this way, "My self-confidence in using the computer is much higher. When I first started the program, I had no idea how to use any of this equipment" (Sweeney).

A nine-month secretarial student provides further insight into the benefits students identify: "I had no background in high school, so I started from 'scratch.' I feel much better prepared to go out on the job market" (Kalvig). Students base their confidence in the knowledge that they have more experience and skills to offer employers as they leave NIACC and its contemporary technology.

Furthermore, students have more positive attitudes since they began working with technology that they recognize will prepare them to qualify for positions in high-tech offices and to function productively for their employers.

In FY 85, the Business Division faculty projected an increased enrollment in courses supported by the proposed office technology, but their estimates fell far short of the actual enrollment; the new office technology was to have

an even greater effect on enrollment than the faculty had foreseen. The data in Table 1 shows that, instead of the projected increase of 19 students, the actual increase in students totaled 54.

Table 1

Programs and Students Served in MH 214

	FY 87 Enrollment	FY 88 Enrollment	
Classes	Actual	Projected	Actual
Accounting Clerk	10	12	16
Clerical Receptionist	2	1	3
Nine-Month Clerical	14	16	27
Executive Secretary	7	9	14
Nine-Month Secretarial	15	18	15
Medical Assistant	17	20	27
Optometric Assistant	18	20	20
One- and Two-Year Medical Secretaries	14	16	17
One- and Two-Year Legal Secretaries	9	11	21
TOTALS	106	125	160

Last year, the Business Division made the following report. "While some students worked with IBM-PC computers on campus, others used them in business and industry settings. While some took credit computer courses, others took non-credit courses. In all cases, the IBM-PCs proved to be even more valuable than we [the Business Division faculty] had anticipated.

"The IBM-PC lab receives such heavy use that students wait in the hall outside the lab to establish a priority for free computers. . . .

"Of course, this demand for access to the computers is a welcome problem because it indicates the increasing worth of the IBM-PC lab investment. However, the demand also denotes a need for more computers" (Contemporary Technology 2 18).

In FY 87, Community Services replaced its IBM-PCs with ten more portable Compaq computers. The IBMs were then transferred to the Business Division. With the addition of the eight IBM-PCs in the MH 206C overflow lab, students benefit by having greater access to and by spending less time waiting for computers.

As anticipated, office technology has provided an automated office environment and allowed more efficient training on word processing equipment. This technology has enabled students to develop more efficient and productive skills and to learn basic language skills from an applied point of view. Moreover, computers have supported the emphasis in the curriculum on the following work factors.

1. Efficient management of time
2. Professional attitude and self-confidence
3. Ability to follow written directions
4. Ability to determine task priorities
5. Ability to work without constant supervision
6. Capacity for accepting criticism

While the applications of microcomputer technology were expected to have an impact on the instructional delivery of Data Processing, Accounting, Marketing, Management, and Salesmanship from the General Business curriculum, the extent of the effect on Data Processing

has exceeded the expectation. The faculty, because of the technology available in the Business Division, has found it possible to respond to the workforce need for more persons who are able to use software applications rather than for those who are able to program. This response has served another purpose in that it grants the requests from four-year colleges and universities for transfer students to have a broader background in software applications than they do in programming.

Although the curriculum still includes some programming in the Basic language, its emphasis has moved to helping students understand and use integrated software packages that include an electronic spreadsheet, data-based management, word processing, and graphics.

As projected, the curricula for the Career programs for Accounting Clerk, Retail Merchandising, and Marketing Management now include software applications covering inventory control, billing, payroll, sales orders, sales analysis, accounts payable, accounts receivable, general ledger, and cash flow. Aided by the microcomputers and software, students in these programs now develop more marketable skills than they had before NIACC's growth in technology.

Program

The ability of NIACC's Business Division to position itself in a strong strategic position with computer technology has had favorable results in a number of areas. The most obvious result is that of increased enrollments in the Division's programs, but there are other more subtle results. Attitudes of both students and staff change when they have technology that they see as a tool that increases their preparedness for the future. Whenever an educational institution can develop an attitude and an environment in which staff and students are moving in the same direction, the Division, even the whole institution, benefits.

As a result of NIACC's leadership in technology, faculty from business departments in Iowa Western Community College in Council Bluffs, Iowa Central Community College in Fort Dodge, and Southwestern Community College in Creston have visited or have corresponded with NIACC's Business Division as they sought counsel in updating their own departments. They have looked to NIACC because of the way in which the Division delivers the curricula for nine programs through one office environment in MH 214 and because of the increased enrollment that the additional technology has generated for the Division.

Yet another benefit experienced by the Business Division stems from the number of area business and industry employees who attend non-credit classes in MH 210. These classes, sponsored by companies, such as A. C. Nielsen and General Foods, and by government agencies, such as the Department of Transpor- tation, feature NIACC's integrated soft- ware packages.

Of course, as a part of or as a result of the benefits identified in the preceding paragraphs stands the increased enrollment the Division enjoys as a direct result of its advanced technology both in hardware and software.

Faculty

Two instructors express the benefits that all of the Business Division instructors appreciate.

"Students are motivated; therefore, I can teach them to be more independent and responsible. Students are learning how to become problem-solvers and are helping each other freeing me to help those most in need of help. Students now see me in the role of office manager and not just as an instructor" (Melhus).

"The computers allow us to work with current business applications rather than just looking at and discussing pictures of these applications. They help me as an instructor to deal with individual differences. When starting something new, like list processing or headers for multi-page documents, students not finished with previous assignments can file their documents for later completion and start on the new material with the rest of the class. The computers make it easier to emphasize the fact that work in the office is continually changing with the times and so must students'/employees' skills if they want to obtain or retain employment" (Schamber).

PLANS FOR EXPANDING BUSINESS TECHNOLOGY

The Business Division proposes a multi-faceted plan for expanding the use of computers in a continuing effort to to deliver quality instructional programming to all of NIACC's market. This plan covers the addition of instructional support, the upgrading of MH 210, the IBM-PC Lab, and modernization of MH 211.

EQUIPMENT SELECTION

Because NIACC intends to remain a leader in using technology to deliver instruction, NIACC's faculty, charged with the responsibility of providing that instruction, must have access to hardware and software in their offices. The need to develop the skills necessary to create and to teach a contemporary curriculum is contingent on instructors' having computers immediately available.

Therefore, the Business Division urges the College to purchase the hardware and software listed in Table 2. Because each instructor will identify the computer that will best serve his or her purposes, vendors are not identified.

Table 2

Proposed Instructional Support Purchases for the Business Division

		Cost	
	Item	Unit	Total
7	Terminals and CRTs	$2,500	$17,500
7	Printers	1,000	7,000
	Software	3,000	3,000
	TOTAL		$27,500

Currently, the IBM-PC Lab has 19 stations and 5 printers. Each station has 256K of internal memory, dual-disk drive, and a color CRT with graphics card. The printers are near letter-quality dot matrix. This facility, with its multi-group utilization, has been oversubscribed since its inception.

Therefore, the Business Division proposes expanding the internal memory of each computer and proposes creating a local area network (LAN) environment.

An instructor expresses this need felt by the entire Division: "A Local Area Network for the IBM-PC Lab, while not an absolute necessity, would be extremely useful. It would enable us to store software on hard disks so that the

student could have free access to it. Presently, we must make a copy for each student of the software that comes with our textbook or put the software in the NIACC library for students to check out (for the licensed software). Either method is an inconvenience for both teachers and students. (It does, however, increase library traffic.) At present, we are considering a new textbook. The text we would like to use would require us to sign a licensing agreement so that we would make no more than 19 copies of the software--one for each computer in the lab. Since we have no librarian in the lab, we would have to store the software in the NIACC library or run the risk of having it stolen--a risk which we cannot accept. Because of this problem, we have chosen to go with less desirable software that can be duplicated in mass quantities. A LAN would solve this problem" (Humphrey).

The components required for establishing upgraded memory and a LAN follow in Table 3. To guarantee compatability, the Division has chosen to use IBM as the vendor.

Table 3

Proposed Technology Purchases for the IBM-PC Lab

	Item	Cost Unit	Cost Total
28	Memory expansion boards	$ 200	$ 5,600
28	dBase III software	200	5,600
1	LAN hardware and software cable, hard disk, file server	20,000	20,000
	TOTAL		**$31,200**

The costs of items listed in Table 3 will vary depending on whether or not a complete integrated software package can be placed on a hard disk in the network environment. If it can be, the need for 28 dBase III packages may be eliminated. Other cost variables depend on the length of cables needed and the size and functions of the file server.

The third facet of the proposal covers the developing of a contemporary environment in MH 211.

Currently used for typewriting, keyboarding, office machines, and recordkeeping, this facility, as proposed by the Business Division, would be expanded into a dual-purpose facility. It would, then, be used for its current purposes and for additional applications to meet the needs of the growing number of students the Business Division serves.

Because this classroom-lab will have such a variety of uses, it must have hardware and software that provide an off-line (standalone) workstation environment with a hard disk that enables students to upload and download programs and that also provides experience on-line with the VAX. Because the computer system has become a focal point of the Business Division's instructional delivery system, the hardware and software must meet the diverse needs of students taking the many types of programs.

The criteria used to select the hardware and software follows.

1. The equipment must be able to run multiple types of application software.

2. Equipment must have stand-alone capability as well as VAX on-line capability.

3. Equipment must allow upgrading in the future.

4. Service orientation support must be provided by the vendor.

5. The system must have a capability to accept applications that can operate multiple operating systems.

The proposed purchases for MH 211, shown in Table 4, fall into two categories: those for the classroom environment and those for the lab environment.

Table 4

Proposed Technology Purchases for MH 211

	Item	Cost Unit	Cost Total
	CLASSROOM ENVIRONMENT		
36	VAXmates	$4,000	$144,000
6	Printers	2,200	13,200
6	20-Meg Expansion Unit	2,000	12,000
	TOTAL		$169,200
	LAB ENVIRONMENT		
12	VAXmates	$4,000	$ 48,000
2	Printers	2,200	4,400
2	20-Meg Expansion Unit	2,000	4,000
	TOTAL		$ 56,400

The VAXmate, produced by Digital Equipment Corporation, best meets the needs for a variety of off-line and on-line applications. In addition, the VAXmates are compatible with all other computers on campus.

CURRICULAR APPLICATIONS

Most of the instructors in the Business Division have, on their own initiative, become computer literate. These instructors now regularly use the computer for class preparation and for professional responsibilities. They have already taken steps to integrate the computer into the existing curriculum; and given the time and adequate computer access, they will be able to move more quickly into evaluating current curriculum and into developing new computer curriculum.

Significant curriculum applications will result from a faculty that is not only knowledgeable about, but skillful in, using computer technology.

With the upgrading of the IBM-PC Lab, the Business Division will incorporate the following elements into the curriculum.

1. Training in using off-line and on-line computer systems.

2. Experience in communicating between terminals.

3. Appreciation of a high level of integrity in the use of software.

4. Familiarity with a wider range of computer applications.

Classes held in MH 211 currently have typewriters and calculators to accomplish the wide variety of activities that take place in the contemporary office. While the preparation of these students is adequate, it does not meet the standard of hands-on computer applications necessary if these students are to compete successfully in the job market.

The curricular applications derived from the reorganization and revitalization of this area would include word processing, data-base management, and electronic mail. These functions are a part of the daily routine in many offices

in which our students hope to and will work.

STUDENTS SERVED

Every student who takes a business course will benefit from having instructors who use computers as a part of their daily office routine and as a part of their preparation for class instruction.

Students in accounting, marketing, management, retail, secretarial, and clerical programs use the IBM-PC lab. Therefore, the LAN in that lab will serve all of those students and will give them experience in working with networked computers.

Also, this upgrade will serve to acquaint employees of area businesses with networking and with off-line and on-line computing. Many companies in North Iowa send their employees to NIACC to take computer courses ranging from basic to advanced. As these students are served, their companies are served.

Credit and non-credit students use the IBM-PC Lab during the weekdays and evenings, on Saturday, and during the summer.

MH 211 also serves a large segment of the student body. Students from the following programs use MH 211.

1. Accounting--Career Option
2. Accounting--Computer Option
3. Accounting--Diploma
4. Accounting Clerk

5. Clerical Receptionist
6. Nine-Month Clerical

7. General Business Cluster

8. Nine-Month Secretarial
9. Executive Secretary
10. Legal Secretary
    (One and two years)
11. Medical Secretary
    (One and two years)
12. Optometric Assistant

This dual-purpose area should provide a multi-divisional computer facility, a resource that would orient all students to networked state-of-the-art computers with windowing capabilities.

The Business Division recognizes that technology is already moving another step in the business and professional world: that step is toward computer interaction.

In Administrative Management, Doug Woodward, a consultant for Arthur Young's Advanced Office Systems, relates his companies experience.

"In our long experience with major-installation management, where we generally test from 60 to 140 workstations across a company, one point is constantly reaffirmed: the micro alone does not 'bring home the bacon.'

"Without question, standalone computers allow the professional to become more productive. Yet the results aren't likely to appear in the balance sheet. Microcomputer functions, like spreadsheets and word processing, can indeed prove beneficial to many uses. The interactive capabilities of applications like electronic mail (not a standalone function) benefit virtually all users. They offer real, hard-dollar savings.

"Likewise, measurable benefits are realized through creating, retaining, and distributing documents electronically. This dramatically reduces paper consumption, the need for copies and file storage requirements. Therefore, an

integrated office system (not standalone micros) can have a significant impact on the way an office works--and ultimately, the bottom line" (15).

The students NIACC will serve in the coming years face a revolution. How well NIACC serves those students will determine how well those students as future employees will be able to deal with the effects of that revolution.
According to the coauthor of The Ergonomics Payoff, Rani Lueder, "It is difficult to understand a revolution when we are so close to it. But when a fundamental restructuring of work takes place, it definitely qualifies as a revolution."

She continues, "So what transitions do we face? Probably the most authoritative and thought-provoking answers to this question were provided by a recent report from the Office of Technology Assessment (OTA) titled 'The Automation of Tomorrow's Offices 1985-2000.'

"They indicate that some of the changes that will affect clerical work are that computers will increasingly communicate directly with other computers, such as via modems, PBXs and LANs. . . .

"These changes also indicate that there will be a fundamental restructuring of the work process in the coming years. This transitional period will be
for those office workers that are not able to . . . bridge this gap. . . . Yet for many other
workers, work will become more meaningful, enriching, and productive.

"OTA also suggests that we need to prepare for a new kind of office worker who is operating on a much higher level of effectiveness and creativity than in the past" (58).

The networked VAXmates will enable NIACC to prepare that "new kind" of office professional.

LOCATION AND LAYOUT

Each instructor will determine the placement of the computer in his or her office.

The IBM-PC Lab will not change in appearance, but will change in power and capability. However, MH 211 will change. Figure 1 shows the layout of that space.

FUTURE PLANS FOR TECHNOLOGY IN THE BUSINESS DIVISION

As the College determines the primary direction of intra-college computing, the Business Division will work to integrate its local area networks with the total College network.

This Division anticipates a day when students will have access to a college-wide networked system. When that system evloves, a student will be able to login on any computer on campus and work on an accounting problem, write a letter, or run Writer's Workbench. On the other hand, a student will be able to begin working on a management project on an IBM computer, logoff to attend class, and, later, move to a free VAXmate to complete the project.

The Business Division looks forward to working with and in an integrated computer system.

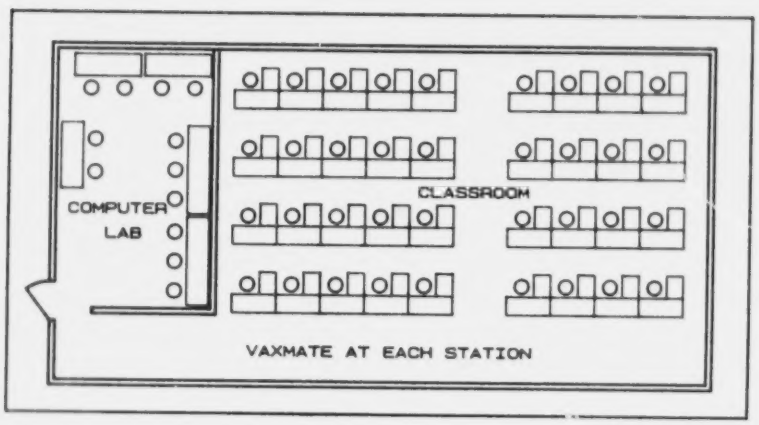

Figure 1

Layout of Classroom-Lab in MH 211
with
Proposed Equipment

PART IV

EXPANDING TECHNOLOGY IN THE HUMANITIES

IMPLEMENTATION OF PRIOR PLANS

Four years ago as a part of the Contemporary Technology initiative, the Humanities Division researched word processing and the writing-analysis program Writer's Workbench as instructional tools for use in the Communications and Communication Skills courses. That exploration led to NIACC's pioneering the use of Writer's Workbench at the community college level.

EQUIPMENT PURCHASED

Supported by Board approval in both FY 85 and FY 86, the Humanities Division purchased 25 DECmate III computers with WPS software. These purchases, made over the two-year period, included the necessary printers, ports, and peripherals at a cost of $74,000.

BENEFITS FROM HUMANITIES TECHNOLOGY INVESTMENT

Students and instructors have enjoyed the positive and challenging experience that they have shared through the addition of technology in Communications and Communication Skills courses.

Students

When students enjoy working on a course or a project, they naturally work more and improve more than they otherwise would. Students enjoy working on the DECmates and revising and editing with Writer's Workbench; therefore, they spend more time revising their compositions and revise more effectively than they had without the use of computers. This effective and extensive use of time spent on writing results in students writing more competently.

Even students who use hunt-and-peck keyboarding agree with a student who said: "The DECmate computers have greatly simplified my paper writing tasks. Before this year and in high school, I always used a typewriter or had to pay someone to write my papers for me. But now I can use the DECmate to write all my documents so I can proofread them before I print them out. The DECmates are very useful and also a real time-saver. No more do I have to hand in papers with dots of liquid ink on them. I also no longer worry about finding someone who has time to type my paper for me" (Meyer).

Another student expressed the view held by many students who have not used a word processor before. "Word processing is very helpful to me. I had never used the program [WPS] before and it was totally alien to me. The option [Word Processing: Basic] helped me through everything until I became more confident. At first I was scared I would mess everything up and need tons of help. Now I feel much more confident and with my yellow document [DECmate III and WPS Documentation] beside me, I feel as if I can proceed and do many different things on the DECmate III" (Stuber).

One student says it all: "Word processing is the best thing since peanut butter sandwiches. It gives the writer the opportunity to change her mind and revise, revise, revise!" (Jorgensen)

Students, also, talk about the benefits they enjoy from using Writer's Workbench. The following quotations reflect many students' assessments of the program.

"Writer's Workbench is my friend. Although last semester, the first time that I used it, I thought of it as an enemy. Now, I realize Writer's Workbench is here only to help me. It goes through my paper and shows me my errors or ways to improve my paper. It's all up to me individually to decide if I want to follow Writer's Workbench's suggestions or if I choose to ignore them. I feel I've improved in writing by 100 percent and anything that can make that big of an improvement in me is considered a friend" (Peck).

"I have really enjoyed working with the Writer's Workbench over the past two semesters at NIACC. I have found it to be very helpful in editing my papers because if I put my paper through the Workbench I know I will take the time to look through my paper for mistakes. I especially like the style -a program because it points out so many things that are useful in helping improve my paper. Since I started using Writer's Workbench, I have found that my readability level has increased because I am more aware of what kind of work is needed to reach a higher level of writing. One of the best things about the Writer's Workbench is that it is available to anyone who chooses to use it and because of its easy use students are not afraid of using it" (Bell).

"Writer's Workbench has been a valuable tool for me in the organization and grammar of my writing. Once I've developed and thought through the theme of my composition, I put those thoughts and ideas into paragraphs. The Writer's Workbench then reviews my writing and gives me ideas and corrections that help me make my writing interesting and understandable to others. It also gives me a variety of ways to express my ideas through different sentence structures and word usage" (Taylor).

"Writer's Workbench has helped me a lot. I have learned to watch for 'being verbs' while I am writing. In fact, I have learned to watch out for a lot more than 'being verbs'; I watch for passives and abstract words and effective first and last sentences in my paragraphs. Last weekend, I went to B. Dalton book store. They have all kinds of books there to help the would-be writer. I spent some time and looked through some of them, and the ones I looked at don't hold a candle to the Writer's Workbench. WWB is so much more personal" (Wyatt).

Even students who take a dim view of their writing skills would agree with this student's evaluation of word processing and Writer's Workbench. "Using Writer's Workbench to me is a life saver. I'm a very poor speller. As a matter of fact, I've been know to spell cat with a k. The word processor is fun to run, and I can see all my mistakes on the screen in front of me. For one who can barely read his own writing, it is great" (Levad).

Originally, instructors had thought students would compose with paper and pencil and, then, transfer the documents to their disks; observation shows that more and more students compose on the computers. Composing in this way saves valuable student time and often leads to greater spontaneity and fluidity in student writing.

As shown in Table 1, students were required to use the DECmates on 886 more papers than the number the faculty had projected for this year.

Table 1

Comparison of Projected and Actual Numbers of Papers Requiring Use of the DECmates

Course	Projected	Actual
Communication Skills	3198	2514
Communications	866	2112
Basic Writing	180	504
TOTALS	4244	5130

While the number of papers actually requiring the use of the DECmates in Communication Skills classes does not meet the projected number, the actual number would have been higher had it included those papers written by students for instructors who offered students the option of using word processing. Even though the number of students using the DECmates option may have been quite high, these papers were not included in this data. Another factor affecting the results stems from some instructors still not finding time to leave their offices to go to the DECmates frequently enough to build confidence in their own skills with the computers.

In Communications, the higher number of papers relates to the growth in numbers of students enrolled in manufacturing technology programs. This increase impacts on the Communications classes' enrollments and, thus, on the number of students using the DECmates. All students in Communications courses are required to use the DECmates on all writing projects.

The significant rise in required DECmate papers in Basic Writing derives from the greater number of students enrolled in Basic Writing and from the greater number of compositions generated by those students.

The application of word processing in the Basic Writing course has been more profound than anticipated. Students spend from 60 to 75 percent of their classtime at the DECmates in addition to their out-of-class use of the computers.

Because these students have frequently developed poor handwriting to disguise their problems with spelling, diction, and punctuation, the printouts make them recognize and consciously face their writing problems. On the other hand, the computers also make revising and editing so easy that students are willing to rework their papers through many revisions.

Moreover, students in Basic Writing often have very low self-esteem; and the "published" appearance of the papers make the writers feel that their writing is important. Once they recognize the importance of the written word, they are willing to put more effort forth in improving their skills.

As part of that endeavor to improve their skills, Basic Writing students use three Writer's Workbench programs: spellwwb, style -a, and findbe. Some of the students, using the Writer's Workbench printouts, work quite independently as they make judgments about the information and about the revisions that they will make.

In Contemporary Technologies 2, a graphic display showed the average number of students using the computers between 8 a.m. and 4 p.m. of a slow week, a week not marked by several instructors' having papers due.

It also showed the predicted numbers of students who would be using the computers this year. Figure 1 updates that information with actual numbers of students using the DECmates in a comparably slow week this year.

When the data did not meet the projection, faculty members questioned students about their ways of handling time when they had to wait for computers. While students last year most often stood around the computers and waited for one to be free, students this year arrange with a student using a computer a time when that student will relinquish the computer. Then, the waiting student works in the Independent Study Lab or in the library or goes elsewhere until the appointed time. As a result, some computer users may leave a computer while others, not realizing one is free, continue to wait in another area.

Therefore, whenever the count exceeds 19 in Figure 1, one or more students are visibly waiting. At any time when the room is near capacity, other students may be waiting in other areas.

In a small, informal sampling of the writing of students using the DECmates and Writer's Workbench during the 1986 spring semester, data shows that, between the first and final drafts, those students increased the reading grade level of their papers by more than a grade level. Most of this increase came through revisions leading to more combined and complex sentence structures. In addition, students decreased their use of elementary and monotonous "subject openers" by over three percent and their use of "to be" verbs by over ten percent.

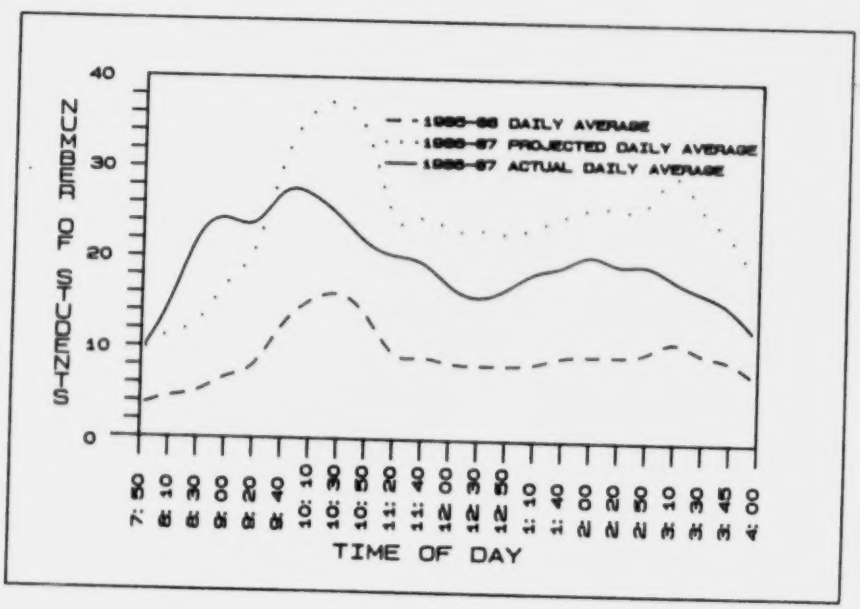

Figure 1

Comparison of Past, Projected, and Present Use
of
DECmates in Writer's Workbench Lab

Although unanticipated and, therefore, not described in previous reports, some students are experiencing a newly implemented curricular application. These students, in Editor Groups and Think Tanks, talk with each other on the DECmates.

The individuals in the Editor Groups turn the screen to face the other members of the group. Then, with printed copies of each members composition, the Editor Group talks (via the computer) with the author and assists him or her with revisions that will strengthen the composition. Although required to spend no more than 20 minutes on each document, the groups have spent over one and one-half hours on some papers.

In Think Tanks, students collaborate on planning and writing a composition. This collaborative work takes place on the computer whenever three or four adjacent computers are available. Communicating in this way is a step toward teaching and learning about writing by writing rather than by talking.

Using computers in the communication courses has benefitted students by enabling them to experience the ease with which writing and revising can take place and by demonstrating for them the quantity of information made available through computers. Students also gain from their experience in evaluating and using information and in creating innovative uses for computers.

Program

NIACC's use of computers and of this sophisticated writing-analysis program has brought attention to the Humanities Division locally, regionally, and nationally. The Writer's Workbench Lab and instructors' and students' use of the Lab has been featured in the local news media, in regional and national conferences, and in a national publication.

Furthermore, the program benefits when a course benefits. According to the instructor, "Without the DECmates, the Basic Writing course would be quite tedious. With the DECmates, students do not recopy their errors and make additional errors as they do when they write by hand" (Watson).

The advantages the computers provide NIACC's writing courses evidence themselves through student responses. Potential students inquire about classes in which they will use the computers. Career students, who sometimes expressed resentment over the Communications requirement previously, now, with the introduction of the computers at the beginning of each semester, respond more favorably. When students respond favorably, programs benefit from the students' enthusiasm and accomplishments.

Instructors in the Communications Complex had anticipated creating a mail system for writing memos to students and for communicating grade progress to students. This application proved impractical within the present constraints. However, the instructors are still working on a highly inefficient and impractical message system as a step toward the time when the instructional management software and mail system required for the project are available.

Even though the instructors continue to develop new skills and new methods of using technology, the DECmates with WPS and Writer's Workbench have changed the atmosphere in which the student and instructor talk about the student's writing. Yesterday, without computer support, the atmosphere was charged with the student's

defensiveness; today, with computer support, discussions of a student's writing are charged with the student's concentration, questions, observations, and suggestions (Brown 16).

Faculty

Whatever hopes the faculty members held for computer applications in the writing curriculum, the reality exceeds the anticipation. Whatever amounts of revision faculty had anticipated, the reality again exceeds the anticipation

The faculty benefits from intellectual and pedagogical growth as they meet the challenges and possibilities of technology. Instructors, rejuvenated by students' responses, seek new and better ways of employing the strengths of word processing and writing analysis. During the fall semester, three instructors explored the possibility of a new type of revision catalyst, "The Writer's Friend," as a replacement for or an enhancement of Writer's Workbench.

Communications and Communication Skills instructors, as a result of their work with composition and computers, have enjoyed the recognition and opportunities their work has generated. Faculty and administration from community colleges, four-year colleges, and universities have sought their counsel through telephone calls, meetings at conferences, and campus visits. Such recognition creates confidence that results in continuing achievements.

PLANS FOR EXPANDING TECHNOLOGY IN THE HUMANITIES

The Humanities Division takes pride in the leadership it has shown in implementing contemporary technology in its Communications and Communication Skills courses and continues to pursue new ways of improving the delivery of instruction through technology.

Not only do Communications and Communication Skills instructors seek support for advancing methods of improving students' writing skills in innovative ways that require integrated communication made practical through networked computers and conferencing software but also instructors in two other areas in the Humanities Division, reading and art, are proposing new computer technology to create a more contemporary learning environment in their programs.

EQUIPMENT SELECTION

During the past two years while writing instructors developed skill in using and in planning for further use of technology, the reading and art instructors were analyzing their programs and exploring the potential for updating those programs through the use of technology.

In its effort to make continuous application of processes to educate and to prepare itself for integrated approaches to instructional uses of the computer and to intra-division and intra-college communication, the Humanities Division recommends the purchase of five computers for offices in the south corridor on the second floor of Beem Center.

With DECmates immediately accessible in their offices, writing instructors will be able to explore facets of the word processing system that they cannot find the time to experiment with when they must leave their offices to go to a computer location only to find all computers in use by students.

The instructors in these offices look toward maximum use of computers in their courses. They, therefore, if they are to remain in leadership roles, need maximum access to computers to ensure that their own skills exceed those of their students.

One computer application that instructors need time to develop concerns the use of the filing and sorting program that is a part of the WPS program on the DECmates. When instructors develop skill in using this program, they will be able to teach students how to record their research notes into a data base of the student's own making and how to sort the data base to meet the organizational needs of their writing projects.

As campus computers are networked with one another and to graphics and publishing programs, instructors will have opportunities to work cooperatively on developing curriculum and on helping students use graphics as part of their effort to communicate effectively in print.

Computers in instructors' offices would also serve as a motivating factor for students to seek instructors' help outside of class. If students can go to their instructors' offices and insert their diskettes in their instructors' computers, they will be able to make revisions as they work with their instructors. Consequently, students will more frequently seek instructors' counsel and will be more likely to improve their understandings of the conventions of their language and their writing skills.

Whenever instructors develop curricular applications in spite of overwhelming constraints, those applications must prove their worth immediately or they die from the students' and instructors' frustrated efforts.

Writing through computer conferencing is just such a curricular application. That application, even with the current constraints, has proved its value in the estimation of both the students and the instructor in one Communication Skills class.

In the experimental work in teaching writing through computer conferencing done at Gallaudet University and now expanded to several other colleges and universities under an IBM grant, conferencing is accomplished via a synchronous conferencing program. That kind of software is not available at NIACC. Therefore, the instructor, with the cooperation and help of the students, devised a more cumbersome and less effective conferencing method that, nevertheless, proved valuable in this experimental effort.

In the IBM-sponsored programs, the writing course is taught exclusively through computer conferencing. In NIACC's informal pilot project, students participated in computer conferencing as an adjunct to other course requirements. In this way, class size can exceed the number of computers available for conferencing.

This attribute adds to the significance of a NIACC "collaboration through computer conferencing" project. Many colleges that could not afford to hold classes to 8 or 10, as required in courses taught exclusively on the computer, could support a class of 16 to 20. Therefore, development of this instructional model not only would contribute to NIACC students' growth in writing skills but also could result in applications in other colleges.

The instructor of this pilot project asserts that the writing of students in this class surpasses that of any class she has previously taught. The students insist that the Editor Groups and Think

Tanks have helped them to make and support writing decisions and to think about ways of presenting ideas appropriately for a given audience.

Students taking part in this pilot program delineate most clearly the instructional advantages of computer conferencing over conferencing around a table and the improvements needed in the conferencing system.

1. In computer conferencing, a student does not lose his or her train of thought while waiting for an opening in the discussion because all participants may "key talk" at the same time with participants reading and responding as they wish.

2. In computer conferencing, a student is more willing to risk an opinion because the computer serves as a less threatening mode of communication than does speech.

3. In the same way that a student feels less threatened when analyzing another's composition and in the same way that students feel no threat from the objectivity of a Writer's Workbench writing analysis, the author whose work is discussed in an Editor Group feels less defensive and more responsive when the analysis is given visually rather than audibly.

4. In any method of conferencing, no participant has time to take adequate notes that will enable him or her to benefit fully from the Editor Group's suggestions or from the Think Tank's discussion and decisions. However, in computer conferencing, no student has to break his or her concentration by taking notes; and all students may review the conference document on screen or print a copy for review away from the computer.

5. In computer conferencing, knowledgeable students seem more willing to share information because their sense of "egghead" is lessened by "keying-in" information as opposed to speaking information. Less knowledgeable students have the advantage of seeing the information (for example, a discussion of why the author needs to use a comma or of the meaning and effect of ambiguity) twice: once as it comes on the screen and again as the student reviews the printout.

6. One of the most substantial advantages of computer conferencing has to do with the magnetism of the screen and the concentration of students on that screen: Students do not digress when conferencing on the screen. They accomplish more because they stay on task.

7. HOWEVER, computer conferencing now requires students to find three or four adjacent computers free because the students must turn the screens toward the other conferees since the computers are not networked and do not have a conferencing capability. This requisite limits the times when students can conference.

8. Currently, students are unable to see what they themselves are writing as the screen must be turned away from the user. With computers with conferencing capability, students could each see what each conferee is saying about the document. Without this capability, students lose the train of their own thoughts which serve a point of reference in reading

others' responses. This liability slows the collaborative process.

9. Computer conferencing, supported by word processing and Writer's Workbench, stands as one of the most exciting and productive learning methods students have experienced in years of classes bent on improving students' writing skills.

The instructor's and students' view of collaborative work find support in the article "Computers and Collaborative Work Among Students" by Janet Simpson:

"R. Slavin, research scientist at The Center for Social Organization of Schools, The Johns Hopkins University, argues that contrary to what one would expect in a society that values cooperation to meet a common goal, schools in America are less characterized by cooperative activity than most other institutions. Students are unaccustomed to working with people who have serious investment in the quality of their work. How closely does the teacher-student interaction and accountability model prepare students for most adult workplaces, where individuals work cooperatively in producing a product or service? If, in a classroom environment, students are only encouraged to work individually, they are not learning how to be successful in a typical workplace environment" (37).

Kenneth Bruffee, one of today's leading researchers and reporters of the teaching of writing, makes a thought provoking statement in Change magazine in the article "The Art of Collaborative Learning" with a subtitle "Making the Most of Knowledgeable Peers." Bruffee writes:

"This is another aspect of collaborative learning too complex to go into here. but raising it momentarily gives us a hint about why collaborative learning may empower students to work more successfully beyond the confines of college or university classrooms. collaborative learning calls on levels of ingenuity and inventiveness that many students never knew they had. And it teaches effective interdependence in an increasingly collaborative world that today requires greater flexibility and adaptability to change than ever before" (47).

Collaboration on computer requires communication with others on computers. As a first step toward providing "routine and convenient communication among computer users" and toward pursuing "instructional. . . and . . . instructional support enhancements" (Buettner 2), the Humanities Division proposes the purchase of nine VAX terminals and of a programmer's time for the redesign of the "Talk" program. (See Table 2 on page 37.)

While use of the terminal would require VAX computer space and time, the use of a server, on which ATECC has space available, would relieve part of the load because a server assumes part of the processing work.

Nine terminals would allow the instructor to assign three groups of three students to the system or two groups of four. With groups of four, the instructor could use the ninth terminal to conference with either or both groups.

At present, a program called "Talk" on the VAX has a capability that a programmer could redesign as a conferencing system similar to that used in the IBM project. This redesigned program would prove useful whenever two or more persons on

campus wished to "Talk" and to keep a printout or on-screen record of the conference.

When the Mason City High School students begin using Writer's Workbench in 1988, NIACC will want to offer an enriched writing-analysis program. Students on the terminals would use the word processing program MASS 11, which, while similar to WPS, has a split-screen capability. The split-screen function would provide the means for continuing the work on "The Writer's Friend," a Writer's Workbench enhancement begun in the fall of 1986.

An additional benefit of adding terminals for the VAX lies in the "Mail" program on that computer. That program could offer the Communications instructors a computer mode for communicating with students.

While VAXmates and MacIntosh computers could offer some of the same characteristics that the VAX terminal system has and even windowing possibilities that the terminal system does not have, the terminals networked through the VAX have one important advantage over the other two computers. A VAXmate system would cost almost $50,000. A MacIntosh system would cost almost $25,000. The VAX terminal system will cost UNDER $8,000, including a printer and programming costs.

NIACC can lay the groundwork for two significant writing instruction tools: composition through conferencing and on-screen revision catalysts to extend writing-analysis beyond Writer's Workbench.

After a semester of experimental and developmental work with conferencing by one instructor, a pilot project involving three or four instructors should develop. This pilot project could include first and second semester classes in Communication Skills, a class in Communications, and a class in Basic Writing.

Because computer conferencing is so absorbing and so engaging, even students whose instructors have not yet incorporated conferencing in their classes will emulate the activities of conferencing. They will do so as they see conferencing students' exhibit their "fun" and as they hear conferencing students affirm the benefits of conferencing.

Even as students find that learning is heightened when the instructional activities are pleasant, they recognize that learning is limited when the environment causes discomfort.

Currently, many students suffer extreme discomfort when working for the extended periods that they frequently work. This discomfort stems from holding their heads at an uncomfortable angle when the monitor is positioned at an awkward height or when the students wear bifocals. Their discomfort often forces them to cut short their writing and revising. Others whose backs ache from long periods of sitting at tables and on chairs not designed for persons working at computers also cut short their work periods. Whenever a student finds the learning environment that uncomfortable, the student's education is shortchanged.

Furniture designed for physical comfort will enable students to work on their writing for longer periods and should result in their developing writing skills that come only with extensive work.

In addition, this furniture would enhance the appearance of the Writer's Workbench Lab, an area that draws the attention of potential students and campus visitors.

The Humanities Division proposes the purchase of computer tables and "back-saver" seats as itemized in Table 2.

Table 2

Proposed Technology Purchases
to
Support Writing Program

	Item	Cost	
		Unit	Total
5	DECmate IIIs	$2,700	$13,500
9	Wyse 85 terminals	4,000	36,000
2	Multiplexers	500	1,000
1	HP Laserjet printer	1,495	1,495
	Programmer(40 hrs.)	23	920
33	Variable height computer tables	147	4,851
35	Back-saver seats	30	1,050
	TOTAL		$26,826

As the writing instructors look toward advancing technology in writing instruction, reading instructors, after careful analysis, seek to heighten reading courses through increased use of computer technology.

Current hardware in the reading lab includes 15 controlled readers and three computers, Two Apple II Plus and one Franklin. The controlled readers were purchased ten years ago. Although they are still usable for rate and comprehension skill improvement, the software, written in the late 1950's and early 1960's and outdated for a number of years, cannot be replaced. Much of the current limited reading software for the computers belongs to the Learning Resource Center.

Although NIACC's reading equipment and materials have not been changed in years, NIACC's student population has changed significantly as more non-traditional students have enrolled. This increasingly diverse student creates increasingly diverse demands on the reading program.

At the same time that the number of Reading Improvement classes has increased, the Humanities Division has added Basic Reading classes to meet students' needs. This growth in numbers of classes and of numbers in classes has severely restricted the individual student's time on the computers and the possibility for the student to work independently in the reading lab when he or she is not in class. Students, on their class evaluations have indicated their concern about not having sufficient opportunities to work on the computers because of the insufficient number of computer reading workstations.

For the reading program to maintain or to regain the excellence expected by NIACC constituents, the instructors in reading must have more reading-based computers available for students.

Therefore, the Humanities Division proposes the addition of five computers. That recommendation, listed in Table 3, is based on the following rationale.

1. All software currently in the lab runs on Apple computers.

2. While some reading software is available for other computers, the greatest number of reading programs are available for Apple computers.

3. Research indicates that some highly recommended reading software runs only on the Apple IIE or Apple GS.

4. All Apple programs written prior to the Apple GS will run on the GS.

5. Some reading programs are being produced in color, which adds to the student's interest.

Table 3

Proposed Reading Technology Purchases

	Equipment	Cost Unit	Cost Total
5	Apple IIGSs with 80-column card	$ 751	$ 3,996
3	Black and white monitors	103	309
2	Color monitors	399	798
1	Laserwriter printer	4500	4,500
10	Disk drives (5.25")	239	1,195
5	Disk drive (3.5 in.)	219	1,095
	TOTAL		$11,893

In Contemporary Technologies 2, the art instructors projected their plans to consider implementing computer supported instruction in their classes.

This year, the art instructors are proposing that NIACC initiate computer graphic arts in its art courses.

By doing so, NIACC will enhance its reputation for a well-rounded basic visual arts program and will improve its students' placement in university and four-year college art departments and in the graphics divisions of potential employers. "It is predicted that there will be some 30,000 jobs by 1990 in this country for people who are trained in graphics" (Lombardi 5).

Four criteria guided the selection of the graphics hardware and software.

1. The computer must be mainframe compatible.

2. The hardware and software must produce high quality visuals.

3. The hardware and software must allow creative applications.

4. The system must be user friendly and move easily.

Table 4, on the next page, provides a comparison of the graphics systems considered for use in the art classes.

Of the five computer graphics systems, the Humanities Division recommends the MacIntosh II. The MacIntosh II has excellent graphics capabilities and a potential for networking, and it meets the established criteria. These itemized recommendations appear in Table 5.

Table 5

Proposed Computer Graphics Purchases

	Equipment	Cost Unit	Cost Total
1	MacIntosh II	$ 3,869	$10,000
2	Internal drives	299	598
1	Keyboard	129	129
1	Color monitor	999	999
1	Color graphics card	499	499
1	IBM interface card	129	129
1	Drive (MS-DOS)	399	399
	Software	400	400
1	Color laser printer	5,000	5,000
1	Computer-printer stand	200	200
1	Cable installation	50	50
1	Software	400	400
	TOTAL		$12,272

CURRICULAR APPLICATIONS

As described in the previous section, office computers will enable instructors to develop skills that they will apply to the curriculum involving research papers. The computers will have another effect on the curriculum as they facilitate the instructors' development of instructional support materials.

Table 4

Comparison of Computers for Graphics System

Description	Computers				
	Apple IIGS	MacIntosh II	Amiga	IBM-PC	Cubicomp
H.R. Color Monitor	Yes	Yes	Yes		Yes
Colors Available	4,096		4,096		4,096
Word Size		32-bit	16-bit	16-bit	
Memory Range	256K-8M	1M-8M	256K-8M	64L-256K	
Mass Storage Configuration(s) Available	3.5,5.25" floppy or 20SC hard disk	3.5,5.25" floppy or hard disk option	40M hard-disk option	5.25" floppy drive, single or dual	Hard disk
Multi-User capability hardware built in	Appletalk networking hardware built in	Appletalk networking; compatible with VAX and IBM	Compatible with VAX IBM Token-ring Network	IBM-PC networking and	Yes
Interfaces and 32K memory expansion	SCSI card disk drive serial modem and printer and mouse ports	Appletalk and Centronics ports, Amiga custom interfaces	RS-232 serial port synchronous and bisynchronous support	Asynchronous	
Colorprinter	Image Writer II no color	Laser Writer Printer printer	Diablo C150 ink-jet		External vendor

The reading instructors will incorporate the computers into the curriculum for both instruction and management. Instructional management benefits the student as it assists the instructor in fitting learning experiences for the individual student's need. By keeping the rapidly multiplying records that individualized learning requires and creates, the computer takes on the time-consuming administrative tasks and enables the instructor to obtain information on the progress rate and problems of the individual student quickly and frequently.

While the applications of technology in reading courses will treat the individual student's needs; the applications of graphic arts in drawing and painting classes will respond to the individual student's artistic expression.

Because the computer is becoming the artist's most versatile tool, instructors in art classes will begin by introducing students to the capabilities of computer graphic systems. In the world of design, the computer allows designers to generate designs much faster than they could by hand. After generating an image, the designer stores the design in computer memory until the client asks for modifications. While revisions by hand required hours, if not days, of the designers time, the artist can change the computer image in minutes.

The art instructors will first make computer graphics applications in the Basic Design I and II curricula; all assignments in these classes will require students to use the graphics systems for all or for all appropriate parts of their work.

In Drawing and Painting classes, the curricula will incorporate students' use of the system for drawing compositions and for exploring color.

These computer graphic systems will enable instructors to show students ways in which many artists presently and in which most artists in the future will depend on computer graphics. Certainly within ten years, artists will be handicapped in their effectiveness if they do not have a computer graphics background.

STUDENTS TO BE SERVED

Every student who has a fulitime instructor should benefit from his or her instructor's having immediate access to a computer. As well as profiting from the instructor's increased skill on the computer, students are more likely to seek help with compositions in process when they can call-up their documents on their instructors' computers and revise as they talk with the instructor.

Of course, all students will have access to the VAX terminals whenever a class that employs conferencing as its major mode of instruction is not using them. In that way, all students will become familiar with the capability of terminals networked through the VAX and with working with an on-line word processing system.

"Talk" and "Mail" will at first serve those students who conference and those in Communications who receive memos via the "Mail" program. Later, this software will enable all students to communicate with instructors at the instructor's convenience as the instructor will access Mail to receive messages or requests for help and will respond so that students may receive help even when the instructor and student cannot coordinate a personal meeting.

Every student who uses the computers in the Writer's Workbench Lab will be aided by the physically beneficial design of the computer furniture.

The following excerpt establishes a base for the curricular applications of the VAX terminals and the redesigned "Talk" program.

"Over the last decade collaborative learning has become an important method for college English teachers, who now realize that their own education rarely taught them how colleagues work together to learn and to make meaning in a discipline. . . . In addition, the problems for education in the seventies and eighties--the changes in student populations, the growth in the number of nontraditional learners in the collegiate body, the alienating nature of learning in large classrooms with too many students, the acknowledged decline of freshmen entry-level skills in reading, writing, speaking, listening, and thinking--these and other challenges to an earlier educational paradigm have shaken our faith in conventional teaching strategies and have called to question our obsession with the major metaphor for learning over the last three hundred years, 'the human mind as the Mirror of Nature.'

". . . Bruffee, drawing upon the works of Thomas Kuhn, L. S. Vygotsky, Jean Piaget, M. L. J. Abercrombie, and Richard Rorty, advances an alternate concept of knowledge as 'socially justified belief.' According to this concept, knowledge depends on social relations, not on reflections of reality. Knowledge is a 'collaborative artifact' that results from 'intellectual negotiations'" (Weiner 52).

Out of such a context, the instructors will draw curricular applications of conferencing. Because these applications needed to be a part of the justification for the request for the VAX terminals, the curricular applications were described in that section of this report. The applications will include students' collaborating as a community of colleagues, an Editor Group, in the revision of compositions planned and drafted individually and in students collaborating in the preparation of compositions planned, drafted, and revised as a community of colleagues, a Think Tank.

Of course, the furniture designed for health and comfort will enable students, previously hampered by physical discomfort, to benefit from the computer applications as they find themselves able to enjoy longer periods at the computers.

As Communications and Communication Skills instructors generate curricular applications that require technology or generate applications resulting from increased technology, reading instructors look to what experts are saying about using technology in reading instruction.

The August, 1986, T.H.E. Journal carries the article "Transforming American Education: Reducing the Risk to the Nation" prepared by The National Task Force on Educational Technology. In that article, the Task Force reports that computers serve effectively in developing both basic knowledge and skills and in making instructional management more effective. The report states that students receiving drill and practice through computer-assisted instruction perform better on objective tests than do students taught by traditional methods.

"The advantage of such lessons over conventional ones is that they combine the precision and clarity that can be built into the presentation with computer's incredible patience. More important, the student can set the pace of instruction and receive immediate feedback for each response. The student must participate actively for any learning to take place" (61).

Many of the students who will benefit from the enhancements in the Workbench Lab will also gain from technological advancements in the reading classes.

During the 1983 and 1984 academic years, the enrollment in reading classes remained steady at 234 and 235. However, in 1985 the numbers increased to 279; and this year, including a projected 44 students for summer session, 288 students will have enrolled in Reading Improvement and Basic Reading classes.

All students who take either reading course will have access to the computers once the proposal is approved and the hardware is delivered.

While the computer serves as an efficient, personal, and vital instruction vehicle for students in reading classes, computer graphics opens new avenues of expression and of educational and employment opportunities for art students.

Students in Basic Design I and II will be the first group to use the system in all assignments. From the growth in numbers of students in Basic Design I over the past two years, the faculty expects the enrollment in both courses to increase in coming years. Those figures are shown in Table 6.

Table 6

Basic Design Class Enrollments

Course	1986	1987
Basic Design I	19	31
Basic Design II	7	7
TOTALS	26	38

In addition, approximately 20 Drawing students will use the system during fall and spring semesters; and 12 to 15 Painting students will work with the system in each of those semesters and in the summer term.

The anticipated total number of students working with computer graphics stands at 125 per year.

LOCATION AND LAYOUT

Of course, the DECmates will be placed in instructors' offices in positions selected by the instructors.

The VAX Terminals will form two clusters in the Writer's Workbench Lab. While the present layout of that Lab does not allow the addition of more computers, the new layout, made possible by the new individual, movable computer tables and space saving seats, will allow the layout shown in Figure 2.

Although the location of the reading lab for next year remains under discussion, the space used for the lab will stay about the same as that in the present lab. Therefore, the room location of the computers is still undecided; however, regardless of the location, the configuration or layout should approximate the plan provided in Figure 3.

Figure 4 shows the planned location of the graphic arts computer. This location permits easy relocation to an alternate position in the painting studio for the convenience of both instructors and students. Because the computer stand is mounted on rollers, the computer can be moved with little effort.

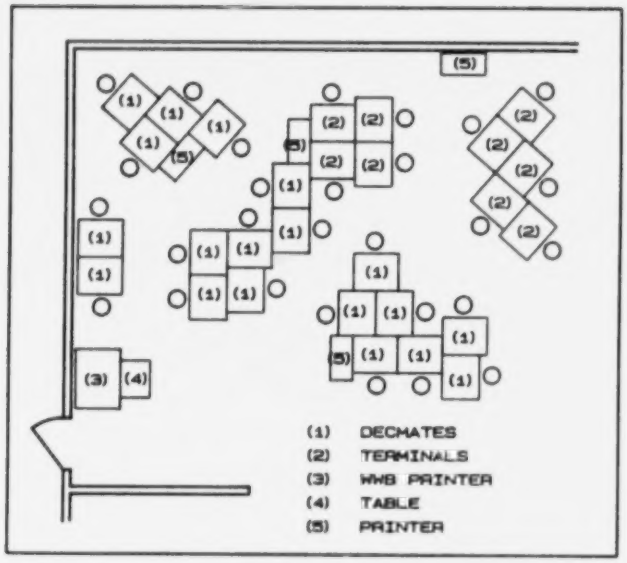

Figure 2

Layout of Writer's Workbench Lab
with
Proposed Equipment

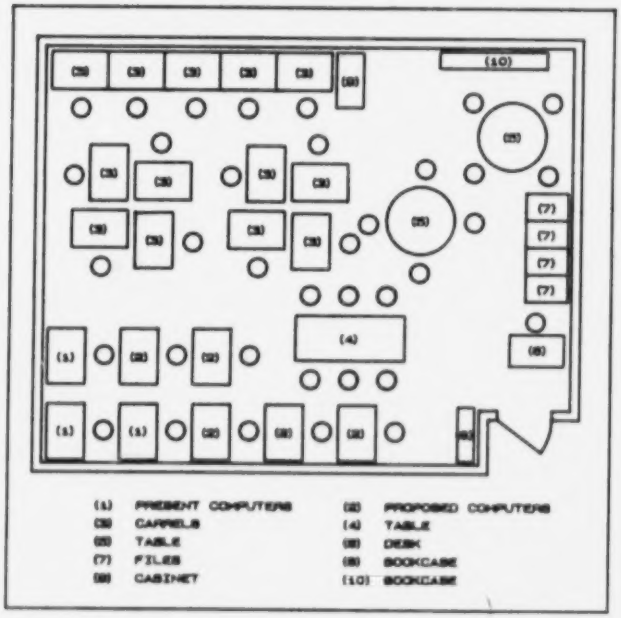

Figure 3

Layout of Reading Lab
with
Proposed Computers

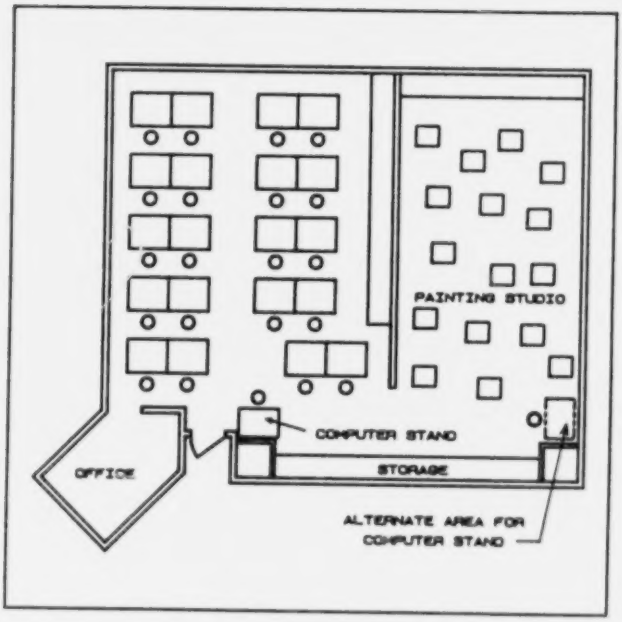

Figure 4
Layout of Art Studios
with
Proposed Graphics Equipment

FUTURE PLANS FOR COMPUTER TECHNOLOGY IN THE HUMANITIES

In physics, the law of motion states that a body at rest tends to remain at rest and a body in motion tends to remain in motion. The Humanities Division, now in motion with technology, will remain in motion.

In the future, those who have developed computer competency will work to help others to work comfortably with word processing and its subprograms filing and sorting. Instructors, in turn, will help students to use this dimension of computing to improve their organizational skills.

Those working with computer conferencing will share their experiences with others to encourage them to use this powerful thinking and writing tool.

Those working with Communications classes look forward to intra-division and intra-college networking. With networking, these instructors will write computer memos to students who will be able to print the memo from any computer on the network. Students, in turn, will be able to leave messages for instructors without waiting to see the instructor. When the instructor reads the message, she or he may leave a response that may even carry lengthy instruction to help the student.

Those who have begun exploring enhancements or replacements for Writer's Workbench will continue to do so in an effort to increase the writing-analysis help provided for students. These enhancements will require a split-screen capability that MASS 11 on the VAX has. With a split-screen, the student may have his or her document on one-half of the screen and may call up instructional support on the other half.

Those working to improve students' reading skills will persist in providing improved delivery systems for even more students.

At the present time, very few Career students have an opportunity to take Basic Reading or Reading Improvement even though the Orientation reading test scores of many of these students indicate that they need to improve their reading skills in order to read their career texts and materials successfully. The reading instructors would, in the future, like to add late afternoon and evening classes to enable these students to take a reading class.

The NIACC student body is expected to increase in the fall of 1987. Because many of these students will not have attended school for many years, a sizable percentage will need to upgrade their reading and study skills. In the next three years, the number of students needing or wanting to take a reading class could easily double.

Currently, the Humanities Division has two reading courses. Students with reading test scores below eighth grade are encouraged to take Basic Reading. Students with scores above eighth grade but below thirteenth or fourteenth grade, the skill level necessary for many college classes, are encouraged to enroll in Reading Improvement.

While 40 students with scores above the fourteenth grade level enrolled in Reading Improvement this semester, the course is not designed for high ability readers. Therefore, the reading instructors hope to develop a course in rate building with advanced critical and analytical reading skills. Besides satisfying the needs of upper level students, this course would draw students from Reading Improvement. As a result, more students with scores below the fourteenth grade level would have access to the Reading Improvement course.

Of course, as the student load increases and as a new course develops, the demands on the proposed computers will increase. In order to provide for all students, more hardware will probably be needed in the future.

Just as the writing and reading faculties will continue to look to and to work toward the future, those working in the area of art expect to move forward with technology.

As the art faculty develops skill in using computer graphics and as more courses incorporate the use of graphics, the need for more stations that allow the use of graphics will increase.

Currently, 150 students enroll in Essentials of Art each year; by 1988, that number should increase to 190. These students could be required to generate a computer image for one or more of their assignments.

As the use of computer graphics in basic courses grows, a need will develop for an advanced computer graphics course, a course that might attract 40 students per year.

A night art class in computer graphics could draw 30 to 40 persons who see a need for graphics in their professional and personal lives.

Furthermore, others than art faculty and students may wish to use the graphics system. For example, photography classes might employ computer graphics as a part of that curriculum. Students in theater courses and in stage productions might design sets and costumes on the computers; the Logos staff might design and print the

newspaper on the system. Communications and Communication Skills students could use graphics to illustrate their compositions. The potential for using and expanding the system will develop as the faculty acquires skill in using all of the capabilities of computer graphics.

The Humanities Division faculty looks to the future in anticipation of the enrichment technology brings to instruction.

PART V

SUMMARY

The increasing use of computer-based technology by business, industry, and postsecondary education requires a continuous investment in updating equipment and people's knowledge and skills. In AREA II, as across, the nation, manufacturers and businesses of all kinds and sizes are expanding their use of technology. Continuous updating is essential for their survival in increasingly competitive markets.

Although contemporary technology is dynamic, complex, and costly, NIACC's initiative recognizes that the College must update its equipment and staff to remain competitive in the post-secondary education market. NIACC has an ongoing obligation to meet the needs of people living and working in Area II.

As a next step towards meeting this obligation, the highest priority items in each part of this plan will be included in the 1987-88 college equipment budget request. Alternative funding sources may be pursued for some of the remaining items. Any other unfunded items, or their updated alternatives, will be considered in the preparation of subsequent college equipment budget proposals.

These strategies will enable NIACC to continue implementation of Career program modernization in manufacturing technology and to expand access to state-of-the-art equipment and procedures in Business and Humanities. Consequently, implementation of this generic plan will enable NIACC to prepare North Iowans for productive lives . . today and in tomorrow's world.

Respectfully submitted,

The Contemporary Technology Task Force
Dr. Alfred R. Hecht, Chairman

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PART V

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